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$$+\tfrac{1}{360}\int_0^{\frac{1}{4}\pi}(4\sin^2\theta+2\cos^2\theta+42\sin\theta\cos\theta-12\sin\theta\cos^3\theta-20\sin^3\theta\cos\theta+\sec^8\mathrm{cosec}^2\theta$$

$$+6\sec^7\theta\,\mathrm{cosec}\,\theta-60\sec^2\theta\,\mathrm{cosec}\,\theta-6\sec\theta\,\mathrm{cosec}\,\theta-36\tan\theta+10\tan^2\theta$$

$$+20\tan^3\theta-\cot^2\theta+20\,\mathrm{cosec}^2\theta+123\sec^2\theta-50\tan\theta\sec^2\theta+5\tan^2\theta\sec^2\theta$$

$$+14\tan^3\theta\sec^2\theta-103\tan^4\theta\sec^2\theta+186\tan^5\theta\sec^2\theta-236\tan^6\theta\sec^2\theta$$

$$+192\tan^7\theta\sec^2\theta-60\tan^8\theta\sec^2\theta+36\tan^9\theta\sec^2\theta+84\tan^{10}\theta\sec^2\theta$$

$$+45\tan^{12}\theta\sec^2\theta)d\theta=\tfrac{119927}{400400}-\tfrac{11}{144}\log 2.$$

$$3p'=\tfrac{359781}{400400}-\tfrac{11}{48}\log 2,\ p=1-3p'=\tfrac{11}{48}\log 2+\tfrac{40619}{400400}.\quad \therefore\ p=.260292.$$

124. Proposed by **F. P. MATZ**, Sc. D., Ph. D., Professor of Mathematics and Astronomy in Defiance College, Defiance, Ohio.

Find the average area of a spherical polygon of $n=6$ sides.

No solution of this problem has been received.

MISCELLANEOUS.

118. Proposed by **O. W. ANTHONY**, New York, N. Y.

If f is determined by the equation $f(\mu\nu)=f(\mu)f^{-1}(\nu)+f(\nu)f^{-1}(\mu)$, where f^{-1} is the inverse of f, show that $f[(2)^\mu]=\dfrac{k^{\mu+1}}{2^{\mu+1}}$, where k is a constant.

Solution by **G. B. M, ZERR**, A.M., Ph.D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

$$f(\mu\nu)=ff^{-1}(\mu\nu)+ff^{-1}(\mu\nu),\ \text{but } ff^{-1}=1.\quad \therefore f(\mu\nu)=2(\mu\nu).\quad \therefore f=2.$$

$$\therefore (2)^\mu=(f)^\mu \text{ or } f[(2)^\mu]=(f)^{\mu+1}=(2)^{\mu+1}.$$

$$\therefore f[(2)^\mu]=(\tfrac{1}{2}k)^{\mu+1},\ \text{where } k=4.$$

119. Proposed bv **L. C. WALKER**, A. M.. Graduate Student, Leland Stanford Jr. University, Cal.

Show how to determine the illumination at any point of the surface of the water at the bottom of a deep well, due to the light from the sky.

A solution of this problem appeared in the November number. The problem was incorrectly numbered. Ed.

120. Proposed by **W. J. GREENSTREET**, M. A., Editor of The Mathematical Gazette, Stroud, England.

Prove $\Sigma\cos^4x-2\Pi\cos^2x+2\Pi\sin^2x=1-\sin(\Sigma)\sin\Pi(y+z-x)$.

Solution by **G. B. M. ZERR**, A. M., Ph.D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

$$\sin(\Sigma)\sin\Pi(y+z-x)$$

$$=\sin(x+y+z)\sin(x+y-z)\sin(z-y+x)\sin(z+y-x)$$